REMARKS

In the Official Action, the Examiner rejected claims 1-16. In the present response, Applicants have cancelled claim 2, amended claims 1, 3-11, and 14-16 and provided at least some of the distinctions between the references cited by the Examiner and the claimed subject matter. In addition, Applicants have included a supplemental Information Disclosure Statement. Accordingly, Applicants respectfully request reconsideration of the pending claims 1 and 3-16 and consideration of claims 17-18.

Interview Summary

In an interview on November 27, 2006, which was conducted with the undersigned, the rejections and claimed subject matter were discussed with the Examiner. Applicants appreciate the Examiner's explanation and discussion of the rejections and cited references. Accordingly, in view of this consultation, Applicants have provided further clarification of at least some of the distinctions of the claimed subject matter in view of the prior art.

Rejection under 35 U.S.C. § 101

The Examiner rejected claims 1-16 under 35 U.S.C. § 101 as being directed to non-statutory subject matter. In particular, the Examiner asserts that the claimed invention does not recite a useful or tangible result. While Applicants do not necessarily agree with the Examiner's rejection, Applicants have amended claims 1 and 6 to further clarify the claimed subject matter. In particular, Applicants have amended the preamble of claim 1 to recite a "computer implemented method" and "specifying a tentative model of a subsurface region of interest for said random field," while claim 6 has been amended to recite a "computer implemented method" and "specifying a tentative model of a subsurface region of interest for said random field having one or more layers." These amendments are at least supported within the specification on pages 1-3, 5-10, 12-14 along with figures 1-5.

Accordingly, the present claims are directed to specifying a model of a subsurface region of interest, identifying connected strings of nodes within the model,

performing a spectral simulation on the connected strings of nodes, and updating the model with results from the spectral simulation. That is, the claim recitations update the model of the subsurface region of interest with data values from the spectral simulation. Accordingly, these claims are believed to provide a concrete, tangible result, which is at least the updated model of the subsurface region. As such, Applicants respectfully request the Examiner's withdraw the rejection of claims 1 and 3-16.

First Rejection under 35 U.S.C. § 102

The Examiner rejected claims 1-16 under 35 U.S.C. § 102 (e) as being anticipated by U.S. Patent Publication No. 2003/0182093 to Jones et al., which is herein referred to as "Jones." Applicants respectfully traverse the rejection.

Jones describes that a subsurface volume 200 includes two-dimensional or three-dimensional array of blocks, which are defined in a XYZ coordinate system. *See* Jones p. 3, para. 0029. A feature 210 is depicted for which azimuthally controlled continuity modeling is desired. *See id.* A thalweg 212, which represents a centerline through the feature, corresponds to the feature 210 and lies on the uppermost surface of the feature. *See id.* p. 3, para. 0029; p. 4, paras. 0033 and 0034. The thalweg may be generated by analyzing the shape and orientation of the feature to be modeled, or interpreted and defined manually. *See id.* at p. 5, paras. 0042-0043. The thalweg is then converted into another coordinate system X*Y*Z* that defines the thalweg to be substantially linear. *See id.* at pp. 4-5, para. 0035. Then, modeling is carried out in the other coordinate system X*Y*Z*. *See id.* at p. 5, paras. 0036-0038.

Applicants submit that Jones fails to disclose "identifying connected strings of nodes within said tentative model, wherein a grid of azimuths is used to identify said connected strings of nodes," as recited in amended claim 1, and "specifying a grid of azimuths for nodes in said tentative model" and "using said grid to identify connected strings of nodes within said tentative model," as recited in claim 6. To begin, Jones does not appear to provide a grid of azimuths for nodes in a model, much less to identify connected nodes in the model from the grid of azimuths. Further, while Jones does define a thalweg for a feature, the thalweg appears to be defined as a centerline

through the feature, which may include connected line segments defined by the XY coordinates. That is, the thalweg is created based on the selected feature (a centerline through a feature), not based on a grid of azimuths in the model. Hence, the Jones reference does not disclose the claimed subject matter.

Accordingly, in view of the remarks set forth above, Applicants respectfully submit that the Jones reference does not anticipate the claimed subject matter. Therefore, Applicants respectfully request the Examiner's withdraw the rejection and allow the pending claims 1 and 3-16.

Second Rejection under 35 U.S.C. § 102

The Examiner rejected claims 1-3, 8 and 15-16 under 35 U.S.C. § 102 (e) as being anticipated by U.S. Patent No. 6,480,790 to Calvert et al., which is herein referred to as "Calvert." Applicants respectfully traverse the rejection.

Calvert describes a process for constructing a 3-D geologic model of a subsurface earth volume. *See* Calvert, col. 6, line 51 to col. 7, line 21. In Calvert, spatial attributes of tentative geologic interfaces and characteristics of the rock properties are calculated. *See id.* at col. 9, lines 18-46. Then, the model is updated by perturbing the model to enhance and update the model. *See id.* at col. 9, lines 47-65. For example, Calvert describes that a model 200 or 300 of blocks representing a subsurface earth volume of two zones 202 and 204 or 302 and 304 is divided by a planar surface or boundary 206 or 306. *See id.* at FIGs. 2A-3B; col. 10, line 60 to col. 11, line 43. From the model 200 or 300, a synthetic seismic trace 210 or 310 is calculated for a column of model blocks, such as column 208 or 308. *See id.* The synthetic seismic trace 210 or 310 is perturbed to match an actual seismic data trace 212 or 312. *See id.* The result of the process provides a better match for the model.

Applicants submit that Calvert fails to disclose "identifying connected strings of nodes within said tentative model, wherein a grid of azimuths is used to identify said connected strings of nodes" and "performing a spectral simulation on each of said connected strings of nodes," as recited in amended claim 1. It should be noted that Calvert appears to identify the connected blocks from individual columns in the

model, not a grid of azimuths. Further, Calvert does not appear to perform spectral simulation on connected strings of nodes, but merely perturbs the columns in the model to more closely match the actual seismic traces. Hence, the Calvert reference does not disclose the claimed subject matter.

Accordingly, in view of the remarks set forth above, Applicants respectfully submit that the Calvert reference does not anticipate the claimed subject matter. Therefore, Applicants respectfully request the Examiner's withdraw the rejection and allow the pending claims 1, 3, 8 and 15-16.

Rejection under 35 U.S.C. § 103

The Examiner rejected claims 4-7 and 9-14 under 35 U.S.C. § 103 (a) as being unpatentable over Calvert and U.S. Patent No. 6,131,071 to Partyka et al., which is herein referred to as "Partyka." Applicants respectfully traverse the rejection.

In the rejection of claims 6 and 7, the Examiner asserted that the Calvert teaches all of the recited features except "performing a spectral simulation on each of said connected strings of nodes, each spectral simulation involving a determination of a phase spectrum from a Fourier transform of each of said connected strings of nodes, a specification of an amplitude spectrum which represents the maximum-desired spatial continuity for each of said connected strings of nodes; and the inverse Fourier transform of said phase spectrum and said amplitude spectrum to determine updated data values for said nodes in each of said connected strings of nodes" and "updating said tentative model with data values resulting from said spectral simulations." *See* Official Action, pp. 12-13. In an attempt to cure these deficiencies, the Examiner asserted that these features are shown by the Partyka reference. However, the cited references, alone or in combination, fail to disclose all of the recited features. For instance, the references fail to disclose or suggest "specifying a grid of azimuths for nodes in said tentative model", "using said grid to identify connected strings of nodes within said tentative model" and "performing a spectral simulation on each of said connected strings of nodes, each spectral simulation involving a determination of a phase spectrum from a Fourier transform of each of said connected strings of nodes, a specification of an amplitude spectrum which represents the maximum-desired spatial

continuity for each of said connected strings of nodes; and the inverse Fourier transform of said phase spectrum and said amplitude spectrum to determine updated data values for said nodes in each of said connected strings of nodes", as recited in claim 6. Hence, the cited references cannot render the claimed subject matter obvious.

In the rejection, the Examiner has again relied upon similar passages in Calvert, which are discussed above with regard to claim 1. For at least the reasons discussed above, Applicants submit that the subject matter of claim 6 is not disclosed or provided in Calvert. That is, Calvert does not disclose or teach "specifying a grid of azimuths for nodes in said tentative model", "using said grid to identify connected strings of nodes within said tentative model," and "performing a spectral simulation on each of said connected strings of nodes, each spectral simulation involving a determination of a phase spectrum from a Fourier transform of each of said connected strings of nodes, a specification of an amplitude spectrum which represents the maximum-desired spatial continuity for each of said connected strings of nodes; and the inverse Fourier transform of said phase spectrum and said amplitude spectrum to determine updated data values for said nodes in each of said connected strings of nodes," as recited in claim 6.

Partyka does not cure the deficiencies of Calvert. Partyka describes a method of processing seismic data to improve quantification and visualization of subtle seismic thin bed tuning effects and other lateral rock discontinuities. *See* Partyka, Abstract; col. 7, lines 10-39. Indeed, Partyka describes that homogeneous thin beds affect the amplitude spectrum of a reflection event by introducing notches, which relates to the thickness of the thin bed. *See* Partyka, Fig. 4B; col. 13, lines 7-55. To visualize the thin beds, a zone of interest is selected from a seismic data line or volume and a Fourier transform is utilized to produce a spectral decomposition of every seismic trace that intersects the zone.. *See id.* at col. 7, lines 55-65. Then, the frequency domain transformations are used to form coefficients of the zone of interest and grouped into a 3D volume, which is referred to as a "tuning cube." *See id.* at col. 7, line 66 to col. 8, line 14. In the tuning cube, each horizontal slice is represents all

of the coefficients that correspond to a single Fourier frequency and is a constant frequency cross section. *See id.* at col. 8, lines 15-24.

First, while the Examiner does not specifically rely on the Partyka reference for the grid of azimuths and using the grid to identify connected strings of nodes, Partyka does not appear to disclose the claimed subject matter. Partyka describes notches, which represent the characteristic signature impressed on a wavelet by an event. *See* Partyka, Fig. 4B; col. 13, lines 40-55. Applicants submit that these notches do not correspond to the connected string of nodes, as the notches do not appear to be identified from a grid of azimuths. As such, the Partyka reference does not disclose "specifying a grid of azimuths for nodes in said tentative model" and "using said grid to identify connected strings of nodes within said tentative model," as recited in claim 6.

Second, cited passages of Partyka do not appear to disclose spectral simulation. In claim 6, spectral simulation includes determining a phase spectrum from a Fourier transform, specifying an amplitude spectrum which represents the maximum-desired spatial continuity, and inverse Fourier transforming the phase spectrum and the amplitude spectrum. While the passage of Partyka describes determining the Fourier transforms to produce a spectral decomposition, Partyka does not appear to disclose specifying an amplitude spectrum which represents the maximum-desired spatial continuity. *See* Partyka, col. 7, line 10 to col. 8, line 32; col. 8, line 63 to col. 9, line 63. Indeed, the spectral decomposition in the cited passages of Partyka include complex Fourier transform coefficients (that include power and phase) of a particular frequency component. Partyka does not appear to specify an amplitude spectrum which represents the maximum-desired spatial continuity, but uses the complex Fourier transform coefficients from the spectral decomposition. As such, the Partyka reference does not disclose "performing a spectral simulation on each of said connected strings of nodes, each spectral simulation involving a determination of a phase spectrum from a Fourier transform of each of said connected strings of nodes, a specification of an amplitude spectrum which represents the maximum-desired spatial continuity for each of said connected strings of nodes; and the inverse Fourier transform of said phase spectrum and said amplitude spectrum to

determine updated data values for said nodes in each of said connected strings of nodes," as recited in claim 6. Accordingly, the combination of Calvert and Partyka fail to disclose or teach the claimed subject matter.

Furthermore, claims 4, 5 and 9-14 depend from independent claim 1, and are believed to be patentable based on this dependence. In the rejection, the Examiner admitted that the Calvert reference does not disclose or teach the subject matter of claims 4, 5 and 9-14. In an attempt to cure the deficiencies, the Examiner relied on the Partyka reference to cure deficiencies of Calvert. However, as discussed above with regard to claim 6, Partyka does not cure the deficiencies of Calvert. As such, because Partyka does not disclose the recited features of independent claim 1, Partyka fails to cure the deficiencies of Calvert for at least the reasons cited above.

Accordingly, in view of the remarks set forth above, Applicants respectfully submit that the Calvert and Partyka references cannot support a *prima facie* case of obviousness. Therefore, Applicants respectfully request the Examiner's withdraw the rejection and allow the pending claims 4-7 and 9-14.

New Claims 17-18

Applicants have added new claims 17-18 in the present response. These new claims are at least supported within the specification on pages 8-11. Accordingly, as these claims are believed to be supported by specification, the amendments are not believed to add any new matter. As such, Applicants respectfully request that the Examiner enter new claims 17-18.

Further, no additional fees are believed to be required for the addition of these claims. However, if additional fees for the claims are required, the Examiner is authorized to charge all required fees to Deposit Account No. 05-1328.

Conclusion

In view of the remarks and amendments set forth above, Applicants respectfully requests withdrawal of the Examiner's rejections and allowance of claims 1 and 3-18. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

December 15, 2006
Date

Brent R. Knight, Reg. No. 54,226
Attorney for Applicant

ExxonMobil Upstream Research Company
P.O. Box 2189
Houston, Texas 77252-2189
Telephone: (713) 431-4563
Facsimile: (713) 431-4664

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